CLAIM AMENDMENTS

We claim:

1. (Previously Presented) A device for producing quantum effects, comprising:

a material fashioned into an elongated fiber shape;

one or more control paths which carry energy along said material;

a plurality of quantum dots, physically connected with said material and energetically connected to said control paths; wherein

the energy carried in said control paths actuate the quantum dots to trap and hold a controlled configuration of charge carriers, thus forming artificial atoms whose size, shape, atomic number, and/or energy level are dependent on the energies in said control paths.

2. (Previously Presented) The device of claim 1, wherein said control paths are electrical wires, whether conductors, semiconductors, or superconductors, which create electrical potentials across the quantum dots.

3. (Previously Presented) The device of claim 1, wherein said control paths are optical fibers carrying light or laser energy.

4. (Previously Presented) The device of claim 1, wherein said control paths are radio frequency or microwave antennas.

5. (Previously Presented) The device of claim 1, wherein the quantum dots are quantum dot particles.

6. (Previously Presented) The device of claim 1, wherein the quantum dots are quantum dot devices.

7. (Previously Presented) A method for controlling dopants in the interior of a bulk material in real time, after a time of initial manufacture, the method comprising:

confining charge carriers in the bulk material in a dimension smaller than the de Broglie wavelength of said charge carriers, such that the charge carriers assume a quantum wavelike behavior in all three dimensions in at least one confinement region;

carrying energy through at least one conduit in said solid material to said charge carriers in the at least one confinement region, without said energy directly contacting said solid material except through said at least one conduit; and

controlling said energy so that artificial atoms are formed by the charge carriers in the confinement region, whose properties can be adjusted in real time;

whereby said artificial atoms serve as programmable dopants to alter the electrical, optical, thermal, magnetic, mechanical, and/or chemical properties of said bulk material in real time.

8. (Previously Presented) The method of claim 7, wherein the step of confining said charge carriers further comprises:

attaching a plurality of quantum dot particles or quantum dot devices to the bulk material; and

energetically connecting said quantum dot particles or quantum dot devices with said at least on conduit.

9. (Previously Presented) The device of claim 1, wherein only the atomic number and energy level of the artificial atoms can be controlled.

10. (Previously Presented) The device of claim 1, wherein only the energy level of the artificial atoms can be controlled.

11. (Previously Presented) The device of claim 1, wherein the material further comprises:

a first barrier layer;

a second barrier layer;

a transport layer located between the first barrier layer and the second barrier layer; and

a plurality of electrodes connected with the control paths; wherein

when energized, the plurality of electrodes interact with the first barrier layer, the second barrier layer, and the transport layer to create at least one quantum well that functions as a quantum dot device.

12. (Previously Presented) The device of claim 1, wherein the material further comprises a memory layer that switches the energy carried to a first confinement region from a first one to a second one of the one or more control paths.

13. (Previously Presented) The device of claim 1, wherein said one or more control paths comprises a single wire.

14. (Previously Presented) The device of claim 1 further comprising an insulating medium, wherein said one or more control paths are positioned in said insulating medium and insulated from each other.

15. (Previously Presented) The device of claim 1, wherein said material is embedded inside a bulk material, serving as a programmable dopant capable of altering the electrical, optical, thermal, magnetic, mechanical, and/or chemical properties of said bulk material in real time based on the energies in said control paths.

16. (Previously Presented) The device of claim 1, wherein said device comprises a plurality of fibers of said solid material woven, braided, stacked, or arranged into two- or three-dimensional structures.

17. (Previously Presented) The device of claim 1, wherein said fiber shape is of a shape selected from the group consisting of: a wire, a ribbon, and an optical fiber.

18. (Previously Presented) The device of Claim 2, wherein said electrical wires are conductive metallic wires.

19. (Previously Presented) The device of Claim 1, wherein said control paths are carbon nanotubes.

20. (New) A device for producing quantum effects, the device comprising:

a material fashioned into an elongated fiber shape;

a plurality of quantum dots, physically connected with said material;

at least one control path physically connected with said material and operatively coupled with said plurality of quantum dots, wherein said at least one control path is adapted to carry energy from an energy source to said plurality of quantum dots; and

a plurality of charge carriers capable of being confined within said plurality of quantum dots to form a respective plurality of artificial atoms;

wherein said energy is adapted to stimulate each quantum dot of said plurality of quantum dots to thereby confine a respective subset of said plurality of charge carriers within each said quantum dot to form a respective one of said plurality of artificial atoms;

wherein said energy determines the size, shape, atomic number, and/or energy level of each artificial atom of said respective plurality of artificial atoms confined in each respective

quantum dot; and

wherein said plurality of artificial atoms alter the electrical, optical, thermal, magnetic, mechanical, and/or chemical properties of said material.

21. (New) The device of claim 20, wherein

said at least one control path comprises a plurality of control paths; and

each of said plurality of control paths is coupled to a respective one of said plurality of quantum dots.

22. (New) The device of claim 20, wherein

said at least one control path comprises a plurality of control paths; and

each of said plurality of control paths is coupled to a respective group of said plurality of quantum dots.

23. (New) The device of claim 20, wherein

said at least one control path comprises a plurality of control paths; and

a subset of said plurality of control paths is coupled to a respective one of said plurality of quantum dots.

24. (New) The device of claim 21 further comprising an energy source with a controllable, differentiable energy output coupled with each of said plurality of control paths, wherein said energy is differentiable between each of said plurality of control paths and each said subset of said plurality of charge carriers is differentiable between each respective quantum dot.

25. (New) The device of claim 22 further comprising an energy source with a controllable, differentiable energy output coupled with each of said plurality of control paths, wherein said energy is differentiable between each of said plurality of control paths and each said subset of said plurality of charge carriers is differentiable between each respective group of quantum dots.

26. (New) A method for controlling dopants in real time in the interior of a bulk material, after a time of initial manufacture, the method comprising:

confining a plurality of charge carriers within a plurality of confinement regions in said bulk material in a dimension smaller than the de Broglie wavelength of said charge carriers, such that said charge carriers assume a quantum wavelike behavior in all three dimensions, wherein each of said plurality of confinement regions contains a subset of said plurality of charge carriers;

carrying energy through at least one conduit in said bulk material to each of said plurality of confinement regions without said energy directly contacting said bulk material except through said at least one conduit;

controlling said energy to form a plurality of artificial atoms, wherein each of said plurality of artificial atoms is formed by a respective one of said subsets of said plurality of charge carriers in each of said confinement regions;

adjusting said energy to change said form of at least one of said artificial atoms in real time by changing a quantity of charge carriers in said respective one of said subsets of said plurality of charge carriers or by changing an energy level of certain charge carriers in said respective one of said subsets of said plurality of charge carriers, thus altering the electrical, optical, thermal, magnetic, mechanical, and/or chemical properties of said bulk material.

27. (New) A device comprising

a bulk material;

a plurality of artificial atoms distributed within said bulk material; and

a plurality of control paths distributed within said bulk material; wherein

each of said control paths is capable of carrying a respective quantity of energy; and

a subset of said plurality of artificial atoms is operatively coupled with a respective subset of said control paths.